FFG FEELER®

WITH YOU
SUCCESS TOGETHER

U SERIES

5-Axis Vertical Machining Center

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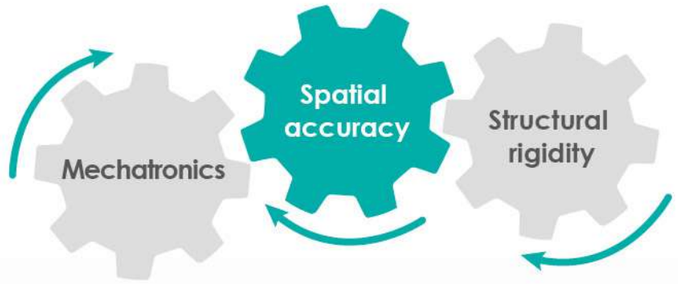
U SERIES

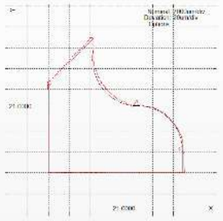
Accuracy x Speed x Rigidity

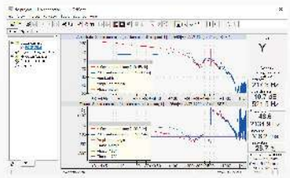
- Assembly Perspective Course
- Accuracy Variation Measurement During Assembly
- Linear Axis Machine Spatial Accuracy Measurement (6D) and Analysis
- Rotary axis / Tilting axis Error Measurement
- Mechanical System Dynamic Test of Frequency Scan of Feed Axis Motor
- Impact Hammer Excitation Mechanical System Modal Test
- Feed System Excitation Acceleration Natural Frequency Impact Assessment
- Accuracy Performance Evaluation of Dynamic Tracking Contour



Mechatronics

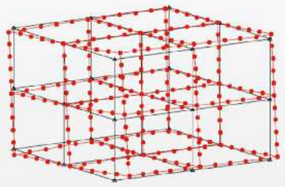
- Feed system frequency response test
- Analyze the response of the load to the feed system
- High gain, high performance response servo control parameter adjustment





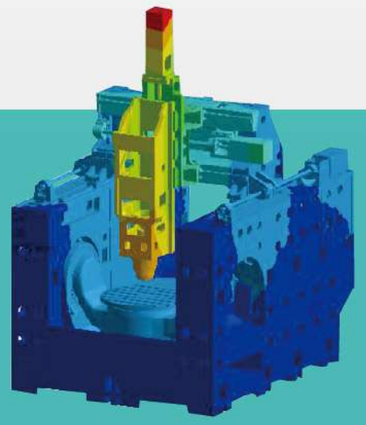
Spatial Accuracy

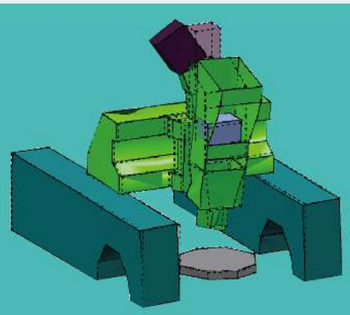
- Discussion and measurement of 43 geometric error sources of five-axis machine
- Apply high-precision spatial accuracy measurement equipment to the assembly process
- Implement precision assembly technology to eliminate errors



Structural Rigidity

- Dynamic performance test for high-performance machining needs
- Analyze the modal shape of the machine structure subjected to cutting forces
- Analyze the modal shape of the whole machine structure driven by feed





5-Axis Concept Introduction → **Basic Technology Development** → **Assembly Concept Establishment** → **Mechatronics Upgrade** → **Practical Measurement Analysis** → **Structural Status Analysis** → **5-Axis Dynamic Knowledge**

U-250
World Advanced Machine

Design Concept
Column traveling structure

- Separated axes movement and machining areas
- Compact dimensions for minimum floor space requirement
- Multiple units connected to set up production line for mass production

Zero malfunction

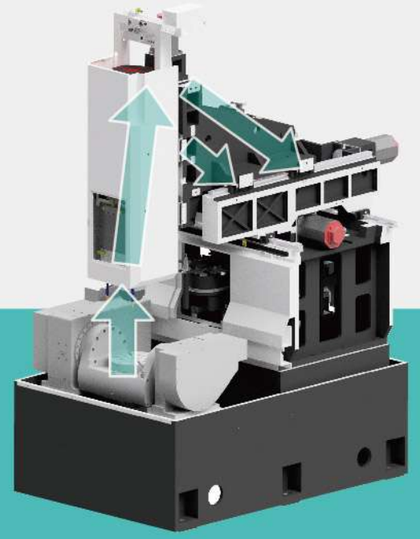
- Cam type tool clamping
- Coil spring for spindle clamping mechanism, instead of disc spring
- Spindle to tool magazine direct tool changing, without arm mechanism
- Reinforced spindle water-proof design avoids bearing damage

A/C axis table

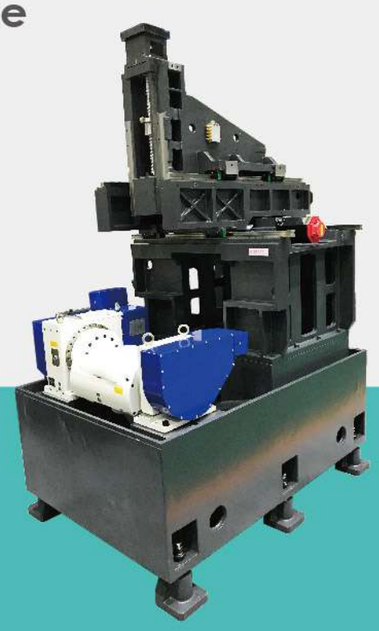
Adopts A/C axis table to enable 4+1 axis contour machining.

High Efficiency
High Stability
High Productivity

Effective Design
Designed by Abbe's principle



U-250 model design eliminates suspension structures on the 3 axes; thereby reducing loading/stress on the axes. Such stress is caused by the counter force generated when machining the workpiece.



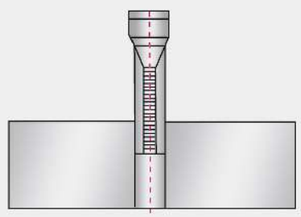
Realizing heavy duty cutting with high rigidity and accuracy :

The overlapped-3 axes, travelling-column structural design features deviation-free movement while Y axis and X axis are travelling. The spindle is mounted on Z axis with minimum distance and suspension. Therefore, the variable loading on spindle is controlled in a low range for best possible dynamic balance.

Cutting Capacity

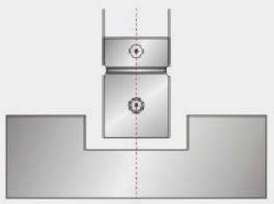
Material : Aluminum

Tapping



Diameter(mm)×Pitch(mm/rev)
M12/M16-M20

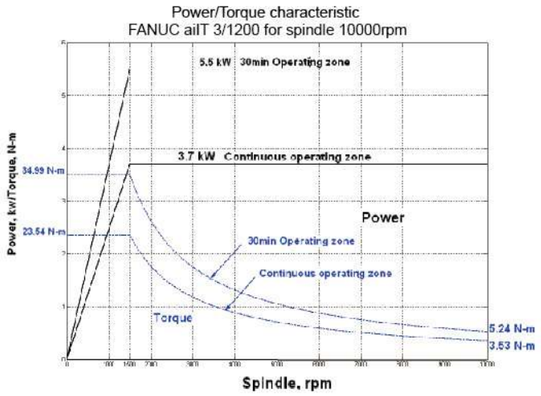
Boring



Width(mm)×depth(mm/rev)×feedrate(mm/min)
φ60×10×3000

Spindle

Spindle taper **#30** Spindle bearing **ø60** Transmission **DDS**



- Speed **10,000 RPM**
- Power (cont. /30min) **3.7 / 5.5KW**

- **Coolant through spindle** (CTS)
  Increase deep hole capability, coolant with high pressure through spindle and tools upon cutting point.

- **2-face Tool Holding** (BBT30)
  2-face tool holding provides excellent dynamic rigidity and accuracy

- **Roller Type Guide Rails**
  Roller type guide rails on X/Y/Z axes provide optimal rigidity and reliability

Chip Flushing

Main flushing flows on 2 sides and nozzle on the bottom provide effective and strong chip removal. Chips are discharged from the center channel.

Centralized chip removal

High efficiency of chip removal from a center channel. Perfect solution for mass production.

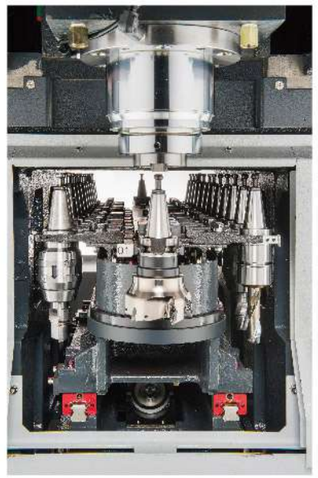
Easy Maintenance

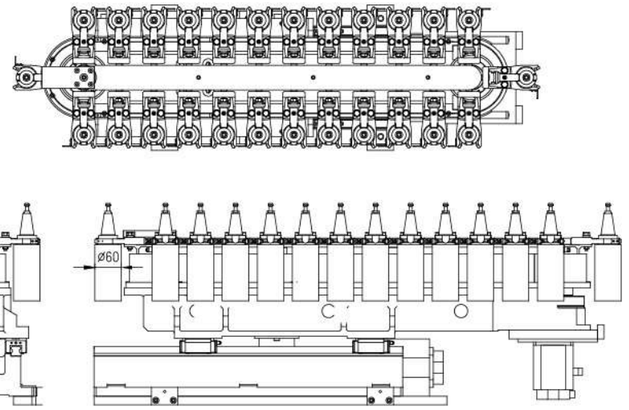
Lube and valves are placed together for easy maintenance.

Control Box

Swivel upper arm of the control box allows flexible positioning of the control box for operational needs.

Wine Rack ATC Mechanism





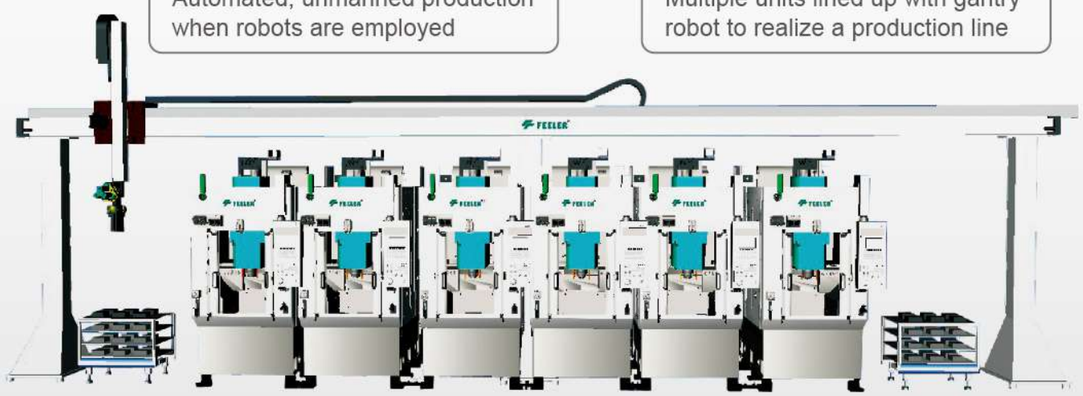
26 tools servo of ATC (STD.)

Robot Automation system

Automation and Lineup Mass Production

Automated, unmanned production when robots are employed

Multiple units lined up with gantry robot to realize a production line



DESIGN CONCEPT

U-600P

Intelligent Machining Function

The U-600P employs anti-chatter technology of “Chatter Lobe” program, which predicts and prevents occurrence of chatter during machining.
Users need to simply input parameters into Chatter Lobe, and then possible chatter and corresponding adjustment of cutting conditions will be provided.

5-axis Machining Feature: (Patent: M437221)

Different from general BC-type, the U-600P is designed as AC type for extensive machining capacity that allows workpiece diameter larger than axis travel. Additionally, such configuration favors view and access.

Wide Operation Area (Patent: M436520)

The operation area is defined with 2 sliding doors granting wide open space. The user can operate from 2 directions corner facilitating the operations and clearing the workpiece monitoring process. This design also favors the loading/unloading, featuring excellent access.

Automotive

3C Products

Medical Products

Parts of Aerospace

Automotive
Motorcycle
Parts

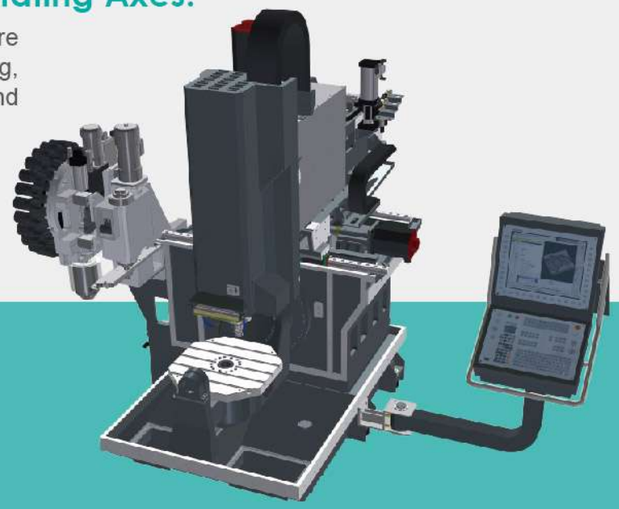
TAIWAN EXCELLENCE 2017

One-piece Base-Column:(Patent:M441538)

The base and column are structured as one-piece casting, which eliminates possible tolerance of the jointing interfaces. The tool magazing is directly mounted onto this one-piece structure so that torque twist is decreased and stability is increased. Box-structure casting and optimal span realize exceptional rigidity and stability.
Large hole on the back offers convenience for assembling and maintenance.

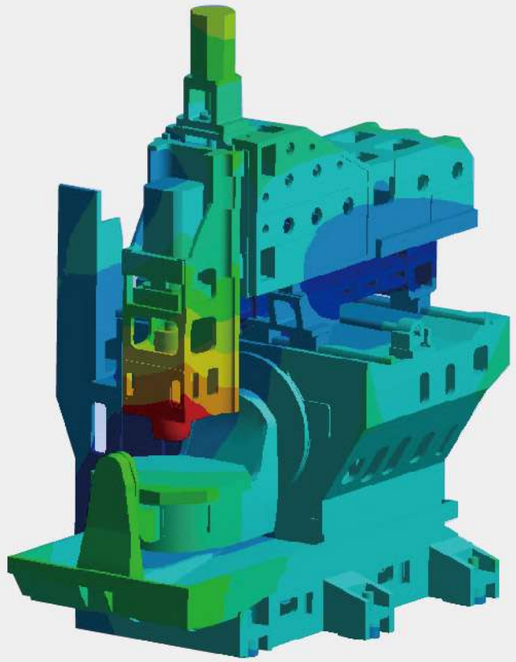
3 Overlapped Axes with 2 Rotating Axes:

Axes of linear movement and rotation are separated so that during 5-axis machining, curve tolerance or error can be controlled and adjusted rather easily.



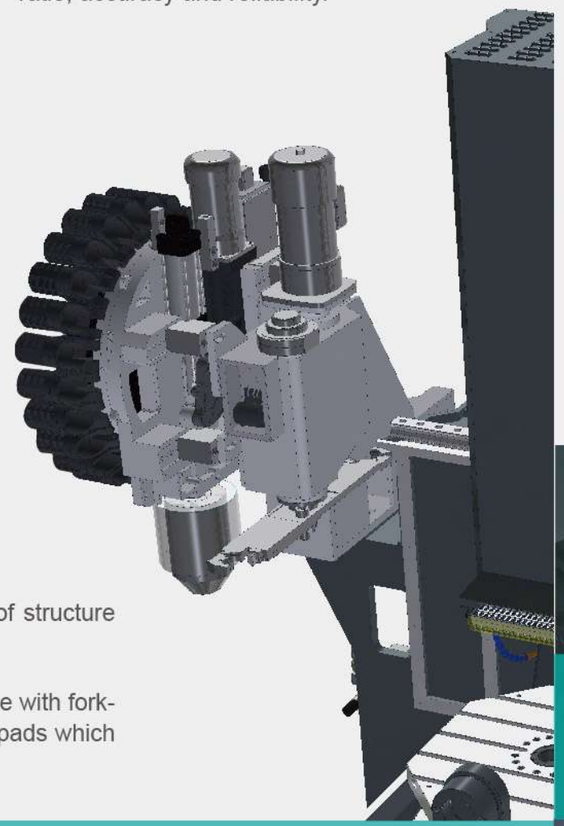
The three-axis motion area is separated from the machining area

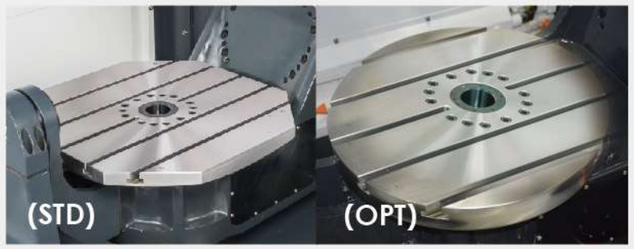
The motion area and machining area of the three-axis feed system are separated from the upper and lower parts of the machine respectively, which effectively improves the efficiency of machine chip removal, and improves the anti-chip and anti-dust capabilities, preventing coolant, cutting oil and chip from entering the mechanism feeding system, thereby increasing the life of the machine, prompting the mechanism to stabilize and extending machine life further to provide excellent machining quality.



Finite Element Method

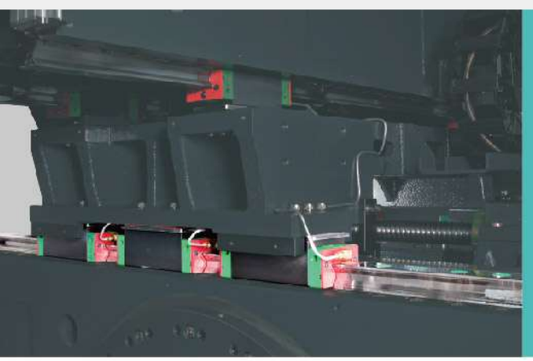
Fair Friend utilizes Finite Element Method (FEM) software for rigidity and FEM analysis. The end result is superior machines with optimum combination of structure, price/performance ratio, accuracy and reliability.





Special design base to mounted ATC can increase rigidity of structure and machining accuracy to reduce accumulated error.

Base with special support is easy to move and install machine with fork-lift. Machine can put in the ground and then put the leveling pads which don't need to aim by technic.

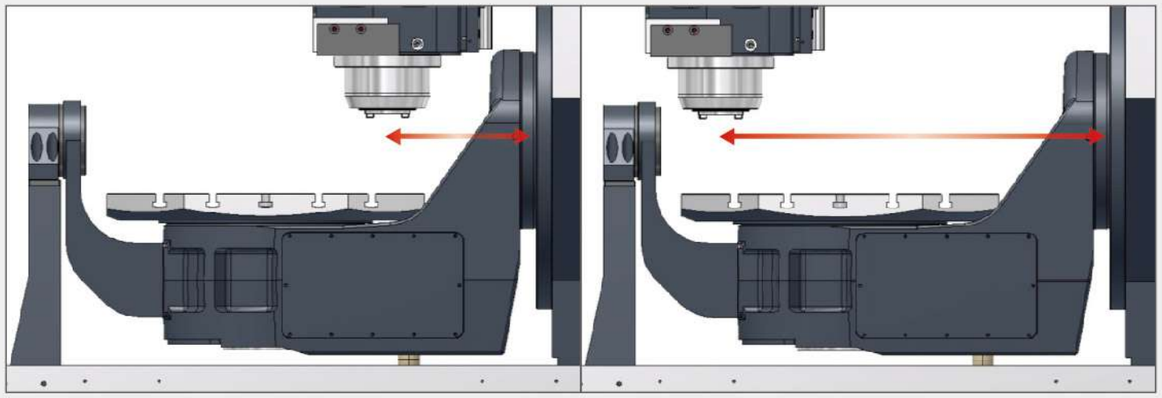


Front three slider design to increase rigidity.

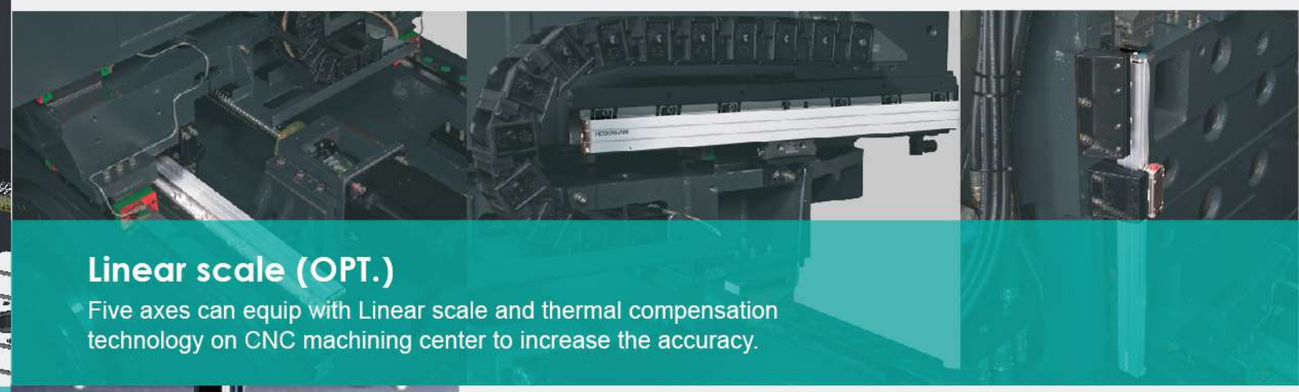
Three axes high precision roller type linear guide ways

LCM rotary working table is made in Italy

Applicable loads	A axis	C axis
A/C axis	Tilting axis	Rotary axis
Rotation range	+110°/-90°	360°
Working torque	2520 Nm	672 Nm
Max rotation speed	25 rpm	25 rpm
Max allowable load	350 kg	



Short spindle hanging distance creates stable structure.
It reduces possibility of thermal drift and bending for cutting force.



Linear scale (OPT.)

Five axes can equip with Linear scale and thermal compensation technology on CNC machining center to increase the accuracy.

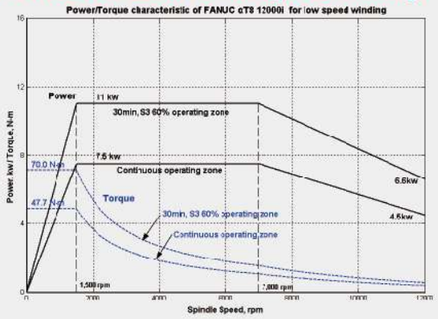
CTS(OPT.)

Spindle with CTS satisfies deep holes machining and adjust the pressure of coolant. It also has thermal compensation to increase efficiency of spindle.

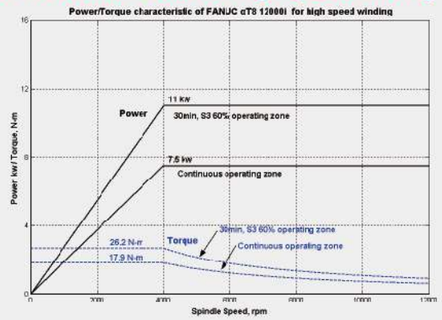
High precision and High Power Spindle

The spindle is specially designed for aerospace, mold, die and automotive parts machining. It provides the maximum torque of 1500 rpm/7.5kw for best performance on large scale of heavy milling. Spindle rotary accuracy is controlled within 4.0μm. It is also guaranteed for precise machining with modular spindle design which can provide various configurations for customers.

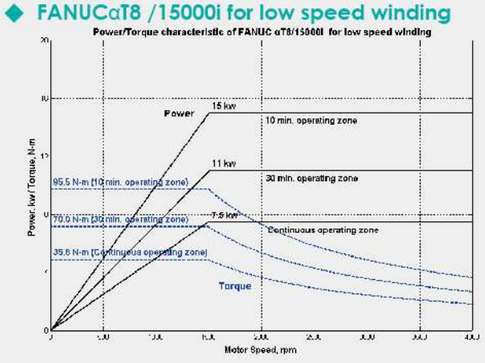
◆ FANUCαT8 12000i for low speed winding



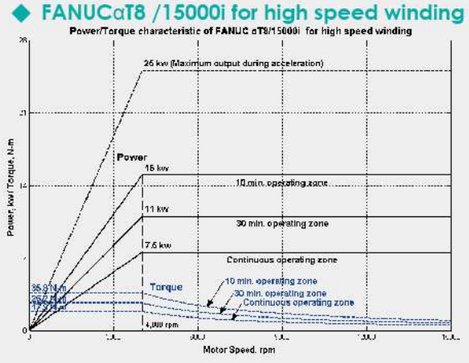
◆ FANUCαT8 12000i for high speed winding



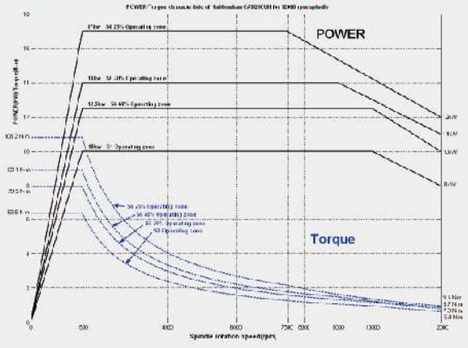
◆ FANUCαT8 /15000i for low speed winding



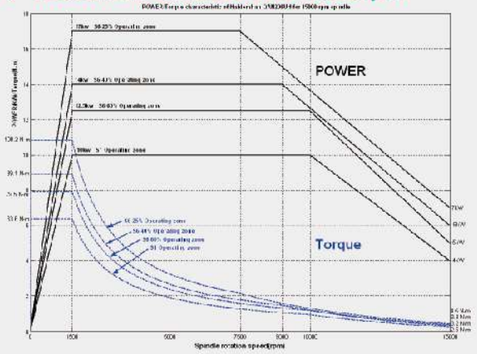
◆ FANUCαT8 /15000i for high speed winding



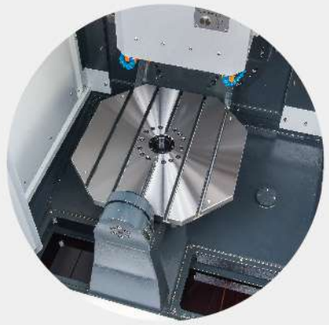
◆ Heidenhain QAN200UH for 12000rpm



◆ Heidenhain QAN200UH for 15000rpm

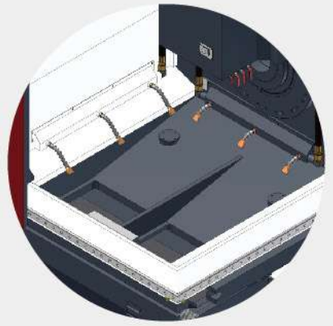


Maintenance



Chip Discharge

Funnel type collection chips in single chips drop hole can increase the efficiency for chips removal



Chip Flushing(OPT.)

Chips are flushed off and working area is kept clear without interference on work-piece and devices.

Full Top Cover(OPT.)

- Corner sliding door design
- Oil mist collector

Enlarged Maintenance Space

On the back and the side, the doors/covers can be detached for larger space.

Lubrication System

Lubrication System (hydraulic/pneumatic/electric),

Hydraulic Unit

Hydraulic components assembly (hydraulic/pneumatic/electric)

Large Hole

The large-sized opening at rear side of the base offers extra convenience for assembly and maintenance.

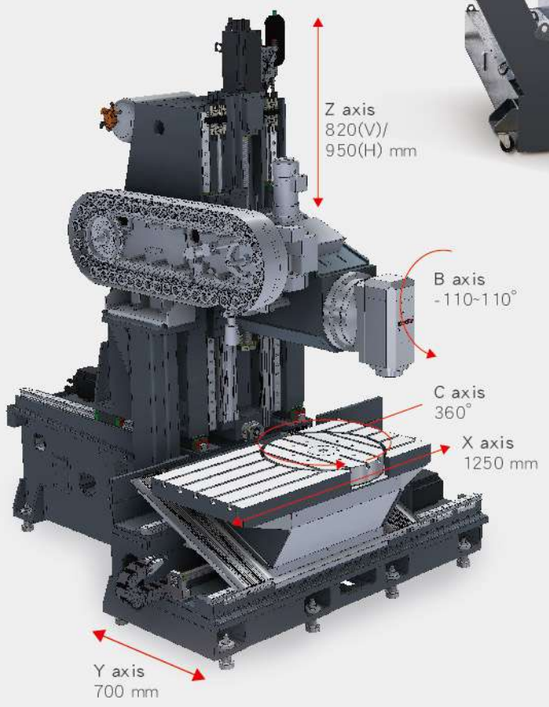
Controller Swing Arm

- Swivel design
- Dual side operation

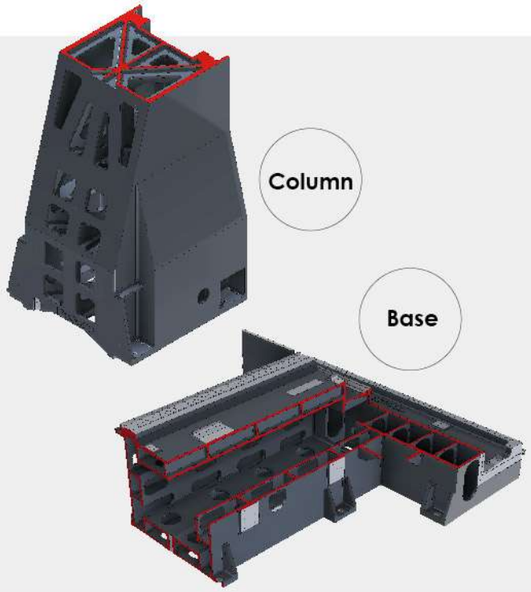
UB-660

5-Axis High-Speed Precision Machining Extraordinary Performance

FEELER five-axis machining center machines are specially designed for high-speed, high-precision machining and finishing. The machine has high rigidity with high feed rate capability to ensure the excellent cutting quality. The UB-660 has the swing-head structure which reduces the machining interference area, as well as optimized structural configuration, including the box structure casting and cross column design, which greatly improves the rigidity and stability of the entire machine. Furthermore, the machine was developed with ODM projects of FFG European & American. Therefore, the machine consists of the high-tech capabilities and all the advantages from Taiwan and Europe technology.



- Adopted with moving column structure to process large and heavy workpieces, with high precision and excellent dynamic performance.
- X-axis stroke of 1250 mm, suitable for processing long and complex workpieces, with large processing stroke and small machining area.
- The composite table can save the fixture installation space. For complex workpiece machining, it can be completed rapidly with only clamping once, which improves the efficiency and saving the machining time.



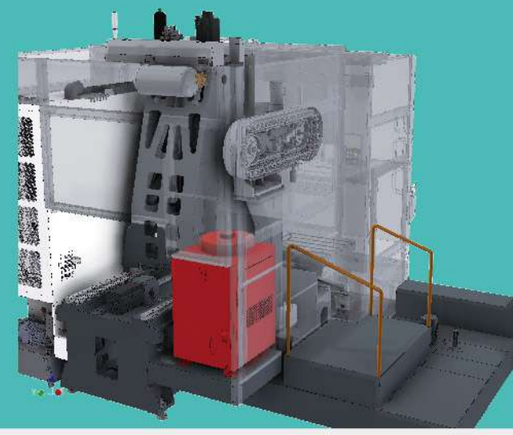
High Rigidity Base and Column

Vertical moving column structure: The m-shaped structure increases the bending resistance and strength of the column, the weight is supported by pneumatic cylinders, and the shape of the column is identical to a pyramid with a larger base to increase movement stability.

One-piece base structure: Optimized structure with excellent rigidity. The internal structure adopts with box structural design to greatly increase the supporting capability. The sand clear holes adopt with a circular shape to facilitate production and flow force improvement, and lastly, the table adopts with high and low rail design to increase rigidity.

Spindle/Swing-head/Table Cooling system

The temperature cooling system uses an inverter liquid cooler, which provides the spindle/ swing-head/ table to maintain stable operation at the optimal temperature, which increases the lifetime of major components, and promotes the machine tool system to be more stable during machining. The dimension and precision are more accurate, which shows the features of high efficiency and precision machining.



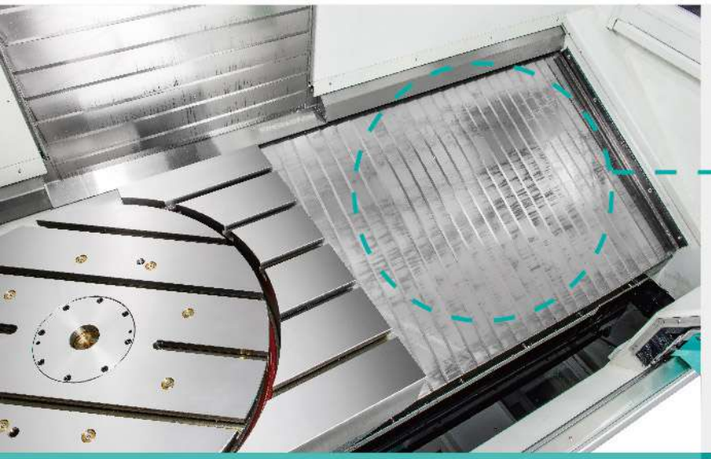
Water Cooler

Inverter type of water cooling system provides spindle, swivel head and rotary table to maintain stable operation at optimum temperature. Increasing the lifespan of key components, make the machine tool system more stable and more accurate in machining, which represents the features of high efficiency and high precision machining.

Pneumatic cabinet

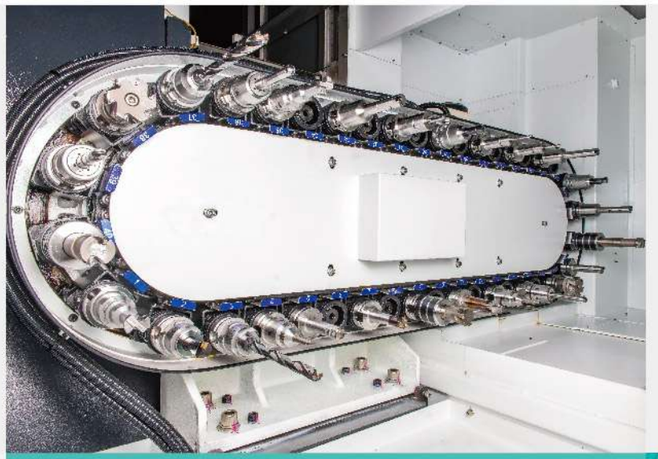
Pneumatic component configuration box (oil, gas, and electric split configuration)

MACHINE FEATURES



X-Axis Telescopic Cover

Bellow type telescopic cover with highly rigid stainless steel protection, low noise, high durability, high cutting temperature resistance ,and rapid traverse.



Chain Type Tool Magazine

The tool magazine is structurally separated from the machine's dynamic area. This makes it easy to check and change tools directly, an absolutely safe tool chain, without stopping the work cycle.

Inside the tool magazine, the machine is equipped with an automatic door for chip protection.Additional tool magazine door on the rear side of the machine for easy access.

Rotary Table

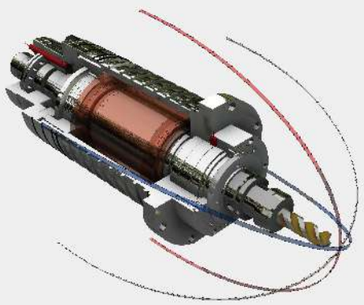
Complex table saves space for fixture installation, for complicated workpiece, which can be completed with just one clamp, increases efficiency and decreases processing time.

The advantages of built-in rotor & stator:

- High speed
- High torque/High acceleration
- High precision/High controllability
- Zero backlash for forward and reverse rotation
- No wear / Low noise

ATC Auto Door

Separate the tool magazine and working area , prevent contamination from chips and coolant.



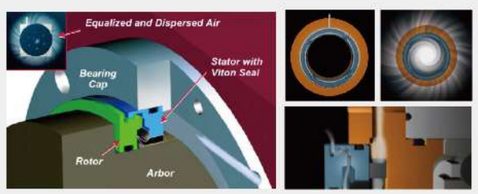
Displacement Sensor & Accelerometer(OPT)

High-speed spindle machining process is prone to thermal elongation and deformation due to linear thermal expansion caused by heat generation. By adding the displacement sensor to measure the displacement information and monitor the temperature information for transmission to the numerical control system for error compensation and positioning to enhance high accuracy and stability.

By adding the accelerometers to perform vibration monitoring, dynamic balance diagnosis, and abnormal vibration warnings for high-precision spindle, so that accurate the spindle status can be accurately read and provided to the user for immediate maintenance and maintenance scheduling.

Bearing Protection System(OPT)

Setco AirShieldTM airtight technology uses a specially designed dedicated air pipeline to redistribute the incoming air to the airflow and generate a uniform pressure under the seal ring to exclude external contamination and effectively eliminate the spindle failure caused by bearing contamination. This technology has been tested and used on many practical applications for many years.



Oil Mist Collector(OPT)

Reduce oil mist during the machining process, avoid poor visibility and reduce air pollution to improve the quality of the work environment.

Paper Filter(OPT)

Effectively separate the impurities in cutting fluid , improve machining accuracy, reduce the number of cutting fluid changes.

Oil Skimmer(OPT)

Separate oil and water , reduce turbidity of cutting fluid , reduce the possibility of environmental pollution.

U-800

5-Axis High Speed Precision Machining, Unmatched Performance

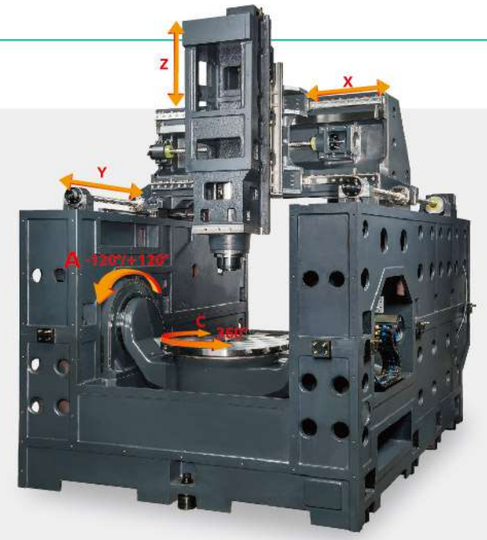
The FEELER 5-axis machining center is designed specifically for high precision machining and creating extra fine finish.Its gantry type structure together with U-shaped base and column brings the structural stability to a new level. The swiveling rotary table diameter is 800mm and capable of resisting heavy loads. This machine is equipped with a 12,000rpm direct-drive spindle that fully satisfies customers expectation in high speed and high efficiency machining.

DDM Tilting Rotary Table (A/C axis)

Applicable loads	A axis	C axis
A/C axis	Tilting axis	Rotary axis
Rotation range	+120°/-120°	360°
Working torque	3340 Nm	1230 Nm
Max rotation speed	50 rpm	100 rpm
Max allowable load	1200 kg	

Features

- No Backlash
- Rapid Rotation
- Durable



Three Axes Overlap and Separated fromTwo Rotary Axes

- This design avoids a distance between the machining point and the intersection point of two rotating axes.
- Easy to compensate for the errors of radius on rotating axes and movement on three linear axes to ensure the machine's stability and accuracy.

Gantry Type Structure

Designed with a gantry type structure, the FEELER U800 5-axis machining center has the feature of spacious machining space, allowing large workpiece to be loaded and unloaded with ease. It is also convenient for operator to check the current machining condition at any time.

Separated Design for Three Axes Moving Area and Machining Area

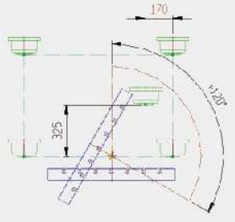
This design feature not only makes chip removal more convenient, but also enables better chip-prevention capability of the machine.

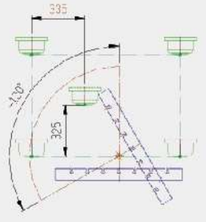
U-shaped Construction of Base and Column

- The advanced U-Shape structure significantly increases structural rigidity and machining accuracy.
- X.Y.Z-axis rapid traverse rate reach 48m/min.
- Suitble for equipping with a large diameter of rotary table.

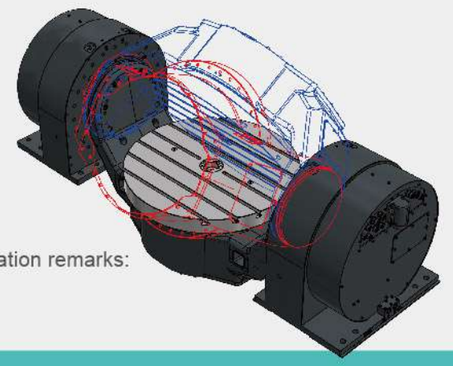
Tilt axis and rotation axis are on five axis tilting body

- Built-in double drive tilting turntable.
- Built-in high torque motor, with high loading, zero backlash and high precision.





Tilt axis inclination remarks:
Red:+120
Blue:-120



Efficient Chip Removal

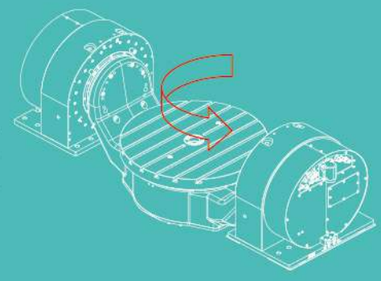
With the one-piece fabricated hop-per-shape outlet port, chips in the machine can be quickly removed.

5-Axis Linear Scales

Standard only for Universal-type 5 axis machine.It provides a closed-loop feedback control and achieves the highest positioning accuracy.

Tilt axis & rotary axis :High speed milling and turning composite turntable

- The high-speed turntable is driven by a built in direct-drive motor , which can reach up to 800rpm.
- Built-in direct drive motors on tilt axis are with torque motor on both sides. For complex and diversified flexible production, the need for com-
- pound processing meets the requirements of rapid proofing and diver-
- sified customization to quantify the increase in production utilization.
- Shorten the machining time, multi-axis to reduce the fixture costs, and continuous machining can improve the accuracy and quality.



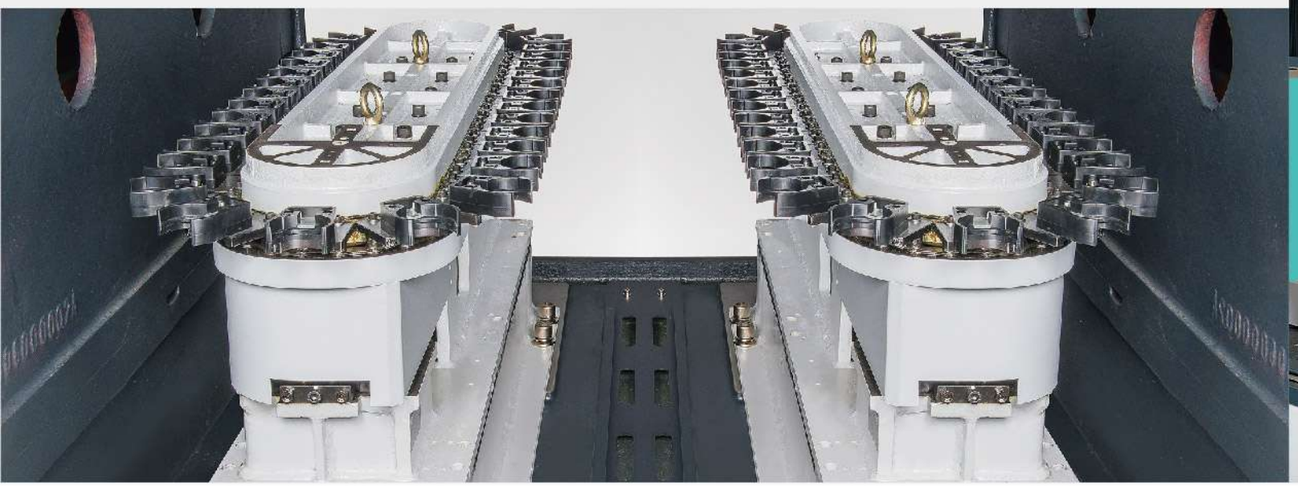
THK Roller Type Linear Guides

- Satisfy the requirements for high rigidity,high speed and high accuracy cutting.

Horizontal Type Tool Magazine

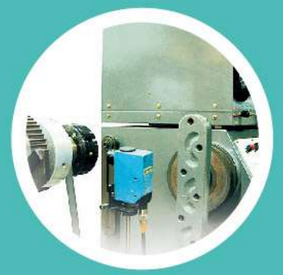
32 Tools Standard 48/60/64/96/120 tools optional

- Driven by a servo motor, the automatic tool changer provides fast tool change with extremely smooth motions.
- Horizontal type construction permits uniform weight distribution of the entire magazine unit.
- Light weight with simplified structure design reduces trouble to a minimum and increases convenience in maintenance.



Precision Inspection Accuracy Guaranteed

At FEELER, we have a strong commitment to provide the best possible machining centers that meet or exceed customers' expectations. Over the years, we have implemented a world class quality control system and the state-of-art inspection equipment.



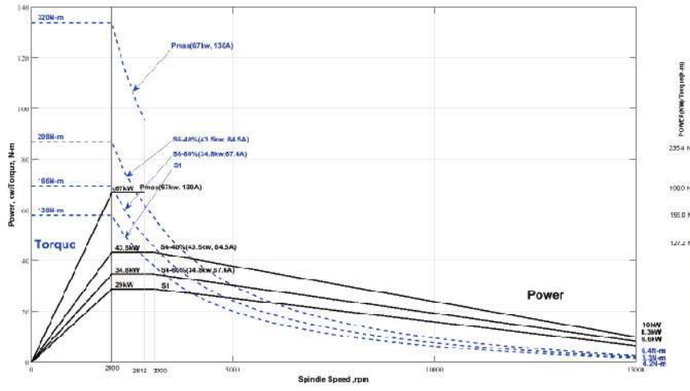
ZEISS 3D Coordinate Measuring Machine

FEELER utilizes the 3D Coordinate Measuring Machine (CMM) to inspect critical parts enauring outstanding parts accuracy.

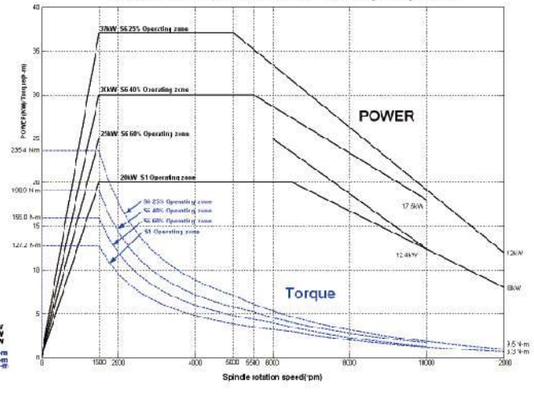
12,000 rpm Direct Drive Spindle

Spindle Output And Torque

Power/Torque characteristic
SIEMENS 1PH8137-1CS02-3MA1-15000 for spindle 15000rpm DDS type



Power/Torque characteristic
Heidenhain QAN260LH for 12000rpm spindle



Spindle Dynamic Balance Test

A high precision balance tester is applied to inspect the spindle dynamic balance. It is also employed to inspect the spindle chattering at high speed. rigid castiron.

Laser Inspection

The laser equipment providespositioning accuracy inspections, ensuring machining accuracy and repeatability

Ball Bar Testing

The ball bar tester is used to inspect the circularity accuracy for a servo axis running on a surface. This test will ensure circle cutting accuracy.

Workpiece	Turbine engine blades
Material	SUS304
Dimension	Ø600*H150
Cutting Tools	Ø25 End Mill cutter R5 Ball milling cutter
Feature	The workpiece is made of aerospace-grade stainless steel, with a high-horsepower spindle and a high-rigid body structure, showing the powerful and high-efficiency performance of the five-axis cutting

Workpiece	Internal gear cutting
Material	Aluminum
Cutting Tools	Gear Hobbing
Gear Hobbing	Machining external and internal gears are on a machine which equipped with a synchronous spindle a.Machining on diverse and complex gear shapes b.Uses wide range of standard cutting tools and simple forming tools c.High-Volume production

U-1000

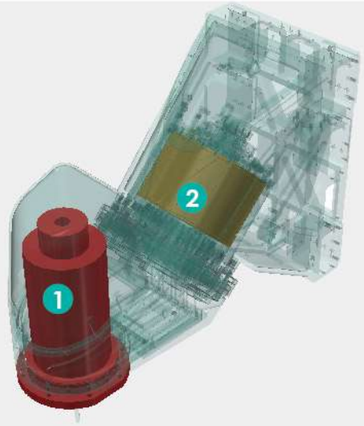
5-Axis Vertical and Horizontal Machining Center with High-Rigidity Structure Design

When designing FEELER U-1000, their creators focused the attention on achieving a set of quality guidelines established for a new FFG product: high rigidity, high precision, high efficiency and stability and extensive applicability. The result is a machine that provides excellent levels of productivity.

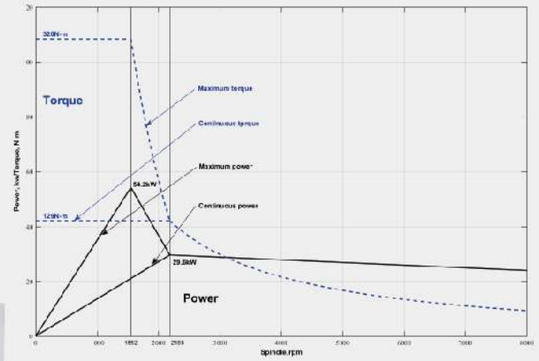
The servo automatic tool changer can accurately memorize which specific tool is needed for a certain machining. This type of technology gives the machine the ability to refine and complete rough surfaces and this ability is especially suitable for processing hard metals and non-metallic materials, satisfying the needs and expectations of every user nowadays.

Application Areas

- Aerospace industry
- Automobile industry
- Mold manufacturing industry
- Energy industry
- 3C industry
- Machinery manufacturing industry



Power/Torque characteristic
MSS202B-0210 for spindle 8000rpm



Vertical-Horizontal Spindle Head:

- The 45 degree spindle head gives a superior level of stability
- The structural rigidity by finite element analysis optimizes the performance by lightening the spindle head
- Standard B-axis optical scale

❶ Spindle

- Use built-in motor to improve machining accuracy
- Spindle speed 8000 rpm
- Optional coolant through spindle.

❷ B axis

- Use DD motor to provide high torque and rigidity
- Direct drive system to show excellent dynamic performance
- Can reach a position from 0° to 180° while machining
- Can carry out three-dimensional continuous machining.

B-axis Using YRT Cross Roller Bearing

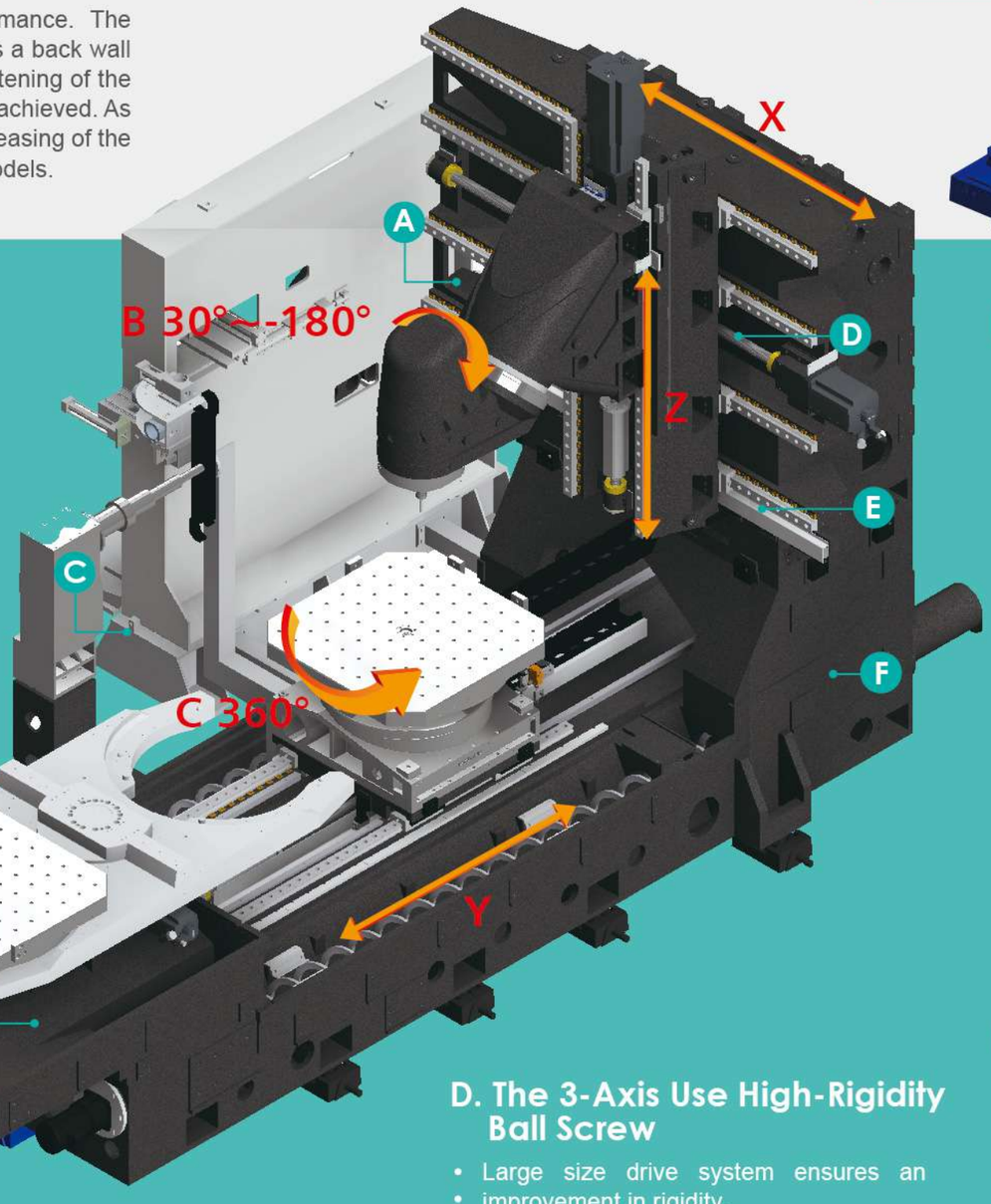
- High axial and radial loading capacity;
- With anti-rust capability;
- Corrosion resistance;
- High heat resistance.

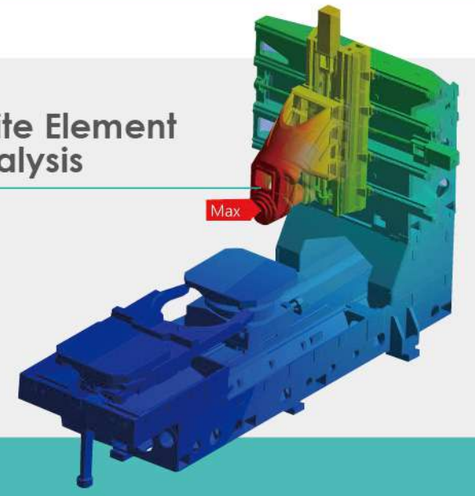
Five Surfaces Processing Applications

- The spindle head is positioned at 0° degrees for vertical machining.
- The spindle head is positioned at 180° degrees for horizontal machining.

Back Wall Structure

High rigidity design allows achieving maximum machining performance. The FEELER U1000 5-axis vertical and horizontal machining center adopts a back wall structure for the design of the main body. With this optimization, a lightening of the weight of the entire structure and an outstanding rigidity advantage are achieved. As a consequence the machine results in having a substantial quality, increasing of the performance, achieving a level of precision that is higher than other models.



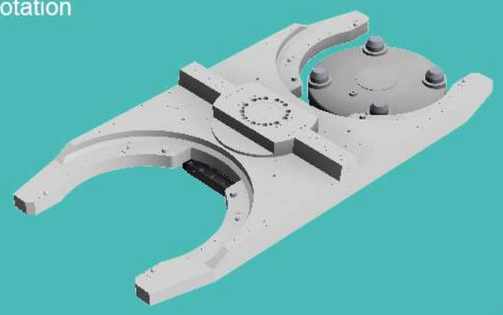


A. Main Structure

- Columns use high tensile steel
- The rest of the structure adopts high-quality, evenly distributed cast iron.

B. APC Servo Rotary Exchange Table

- The maximum diameter of the table is 1000mm
- Unilateral maximum loading capacity of the table is 2000kg
- The large positioning taper cones enhance the position accuracy
- The servo system ensures high precision and repeatability of the rotation



C. Chain Magazine with Tool Changing Servo System

- Standardly equipped with 40 tools, to guarantee a large variety of cutting shapes
- Provides the longest 550mm and 250mm diameter, the largest diameter of the tool selection (adjacent tool).
- Optimization of the design of the oil water recollection system.
- Tool change system using servo control, allowing the regulation of the speed according to the weight of the tool.

D. The 3-Axis Use High-Rigidity Ball Screw

- Large size drive system ensures an
- improvement in rigidity.
  Optional hollow 3-axis ball screw with oil cooler hollow.

E. 3-Axis Use of Heavy-Load Roller Type Linear Guideways

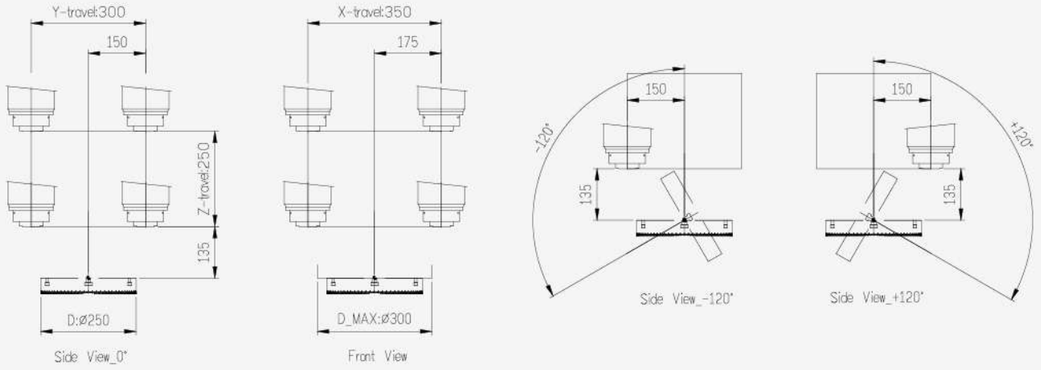
- Line contact guideways type can withstand heavy loads. Special elastic properties allow beneficial microscopic deformations that greatly enhance the rigidity of the linear slide to maintain high-precision machining.
- X-axis designed with 4-guidelines placed at a large spam, provide a solid support base to the vertical-horizontal.
- Y-axis with linear guidelines placed at large spam is a design studied according to a formula that better sustains the fulcrum of the machine providing the least possible amount of deformation to the beam and to the entire structure.
- Z-axis guideline without weight counterbalance, designed to provide a quick response and allow symmetrical heating of the structure, that avoids deformations due to excessive temperature rise.

F. Structure Design Optimization

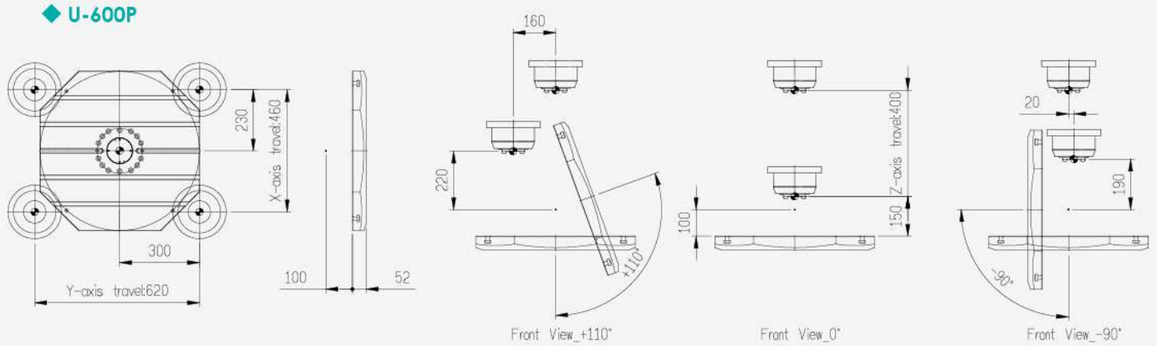
- The back wall of the structure was strengthened with a new high-rigidity design.
- A finite element analysis and a modal analysis are carried out for the entire structure to ensure the optimization of the rigid design.
- 3 support points are optimized to guarantee machine rigidity and cutting efficiency.

Working Area

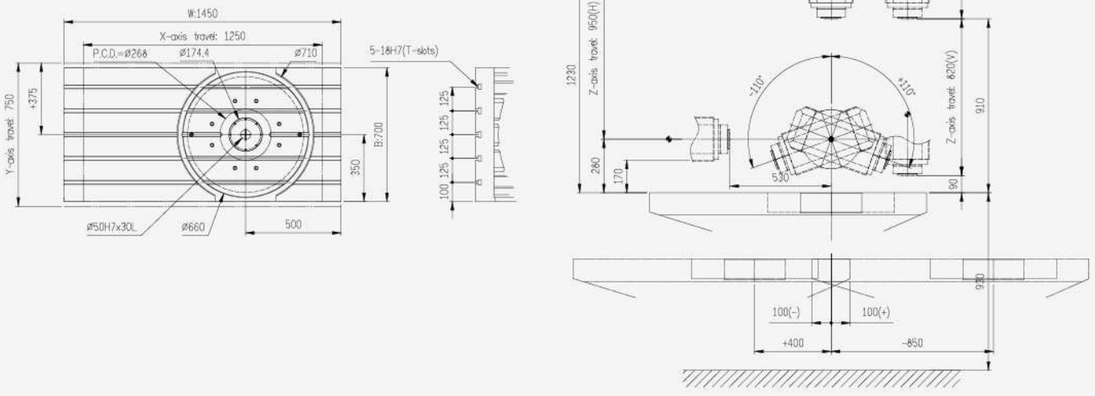
◆ U-250



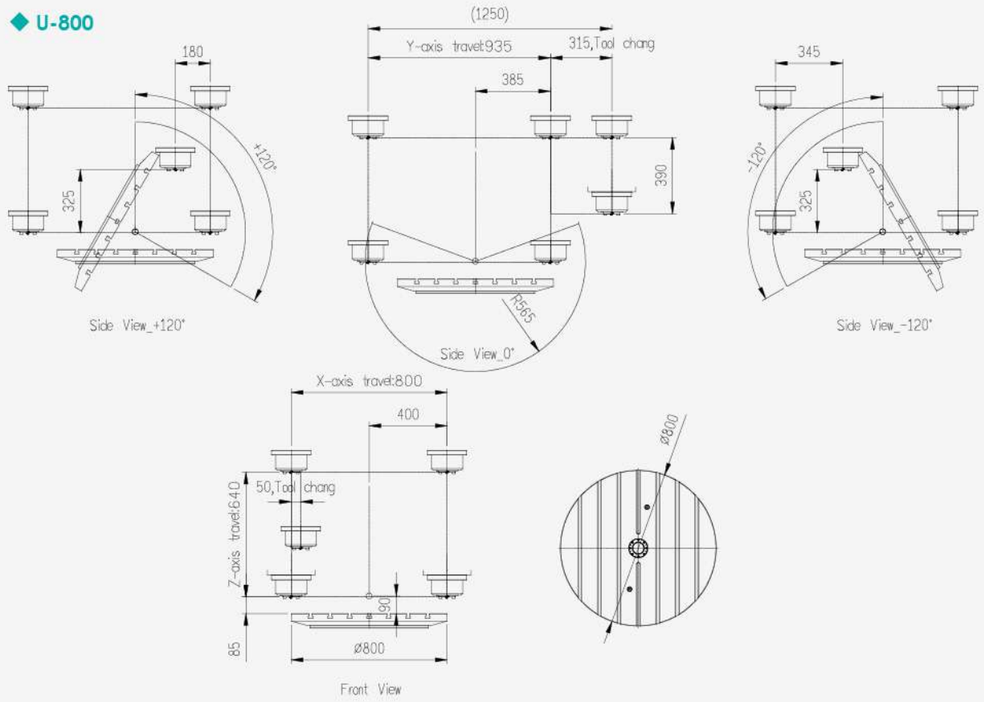
◆ U-600P



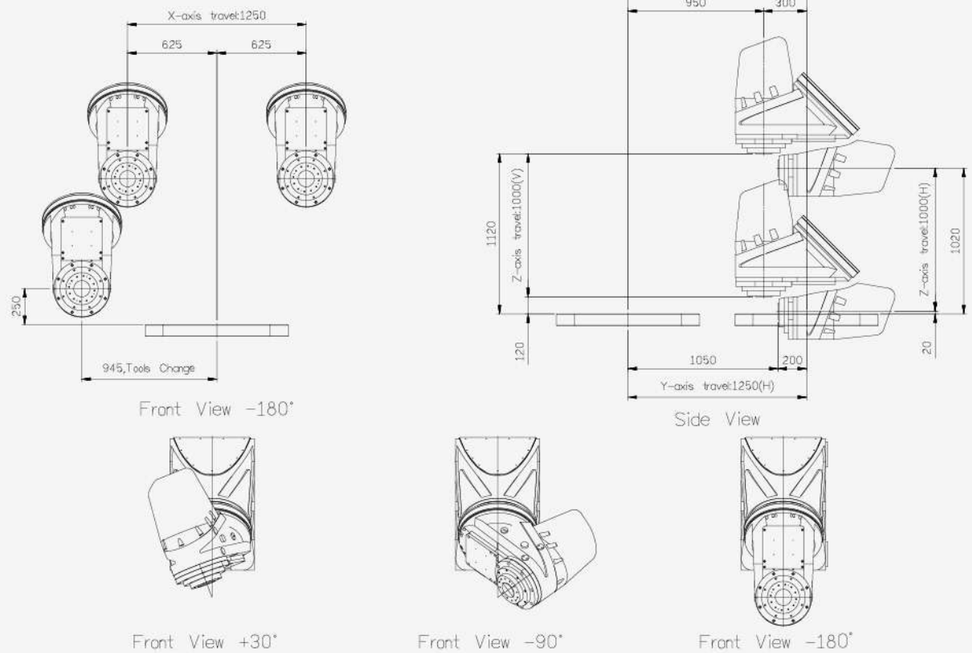
◆ UB-660



◆ U-800

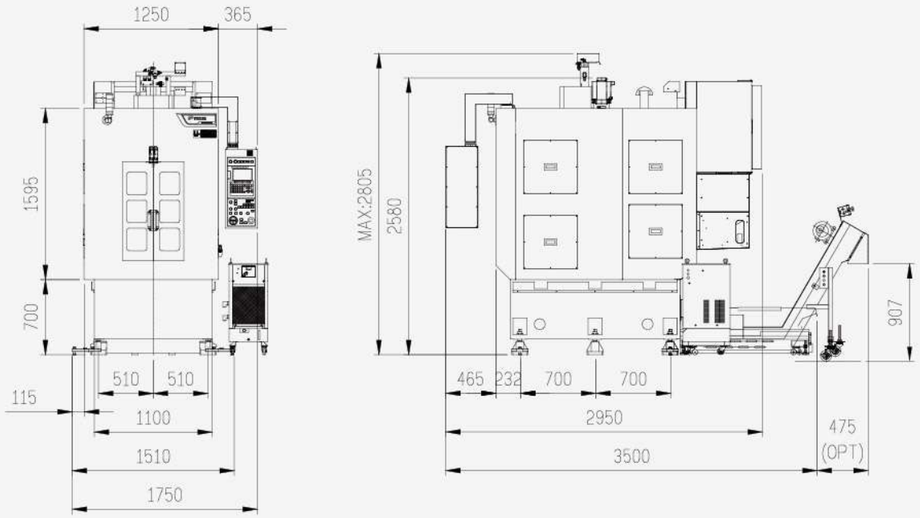


◆ U-1000

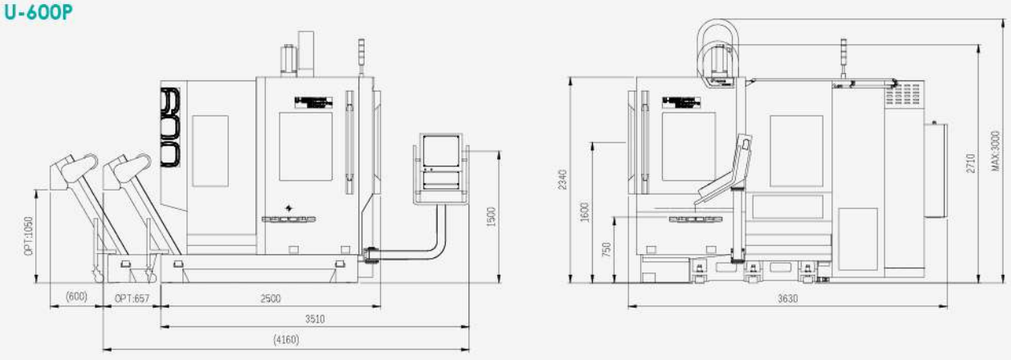


Floor Space

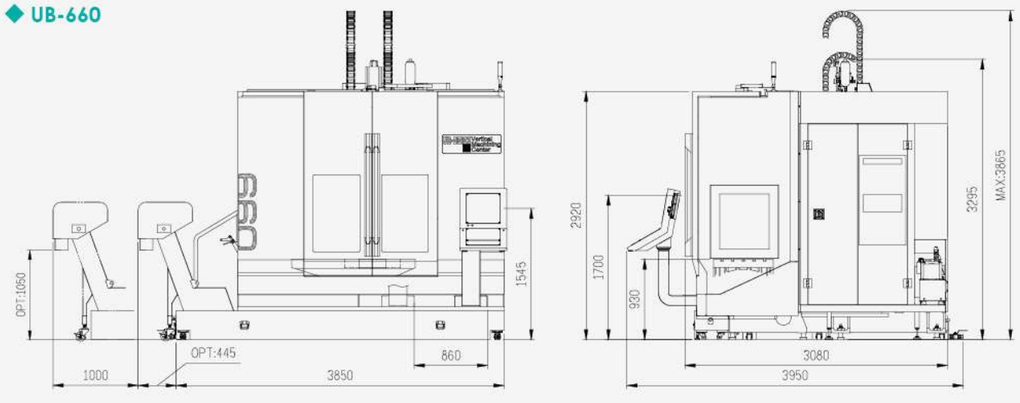
◆ U-250



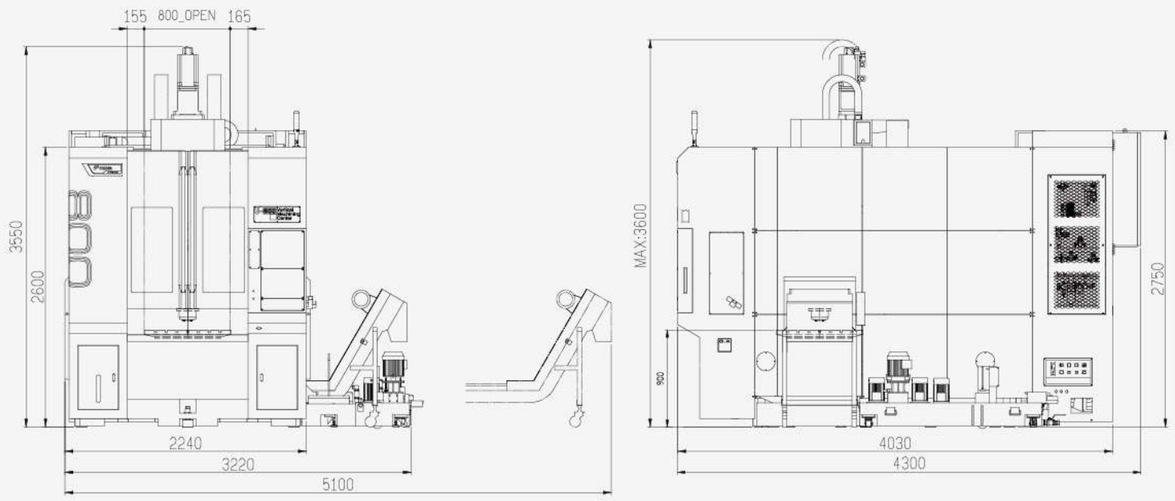
◆ U-600P



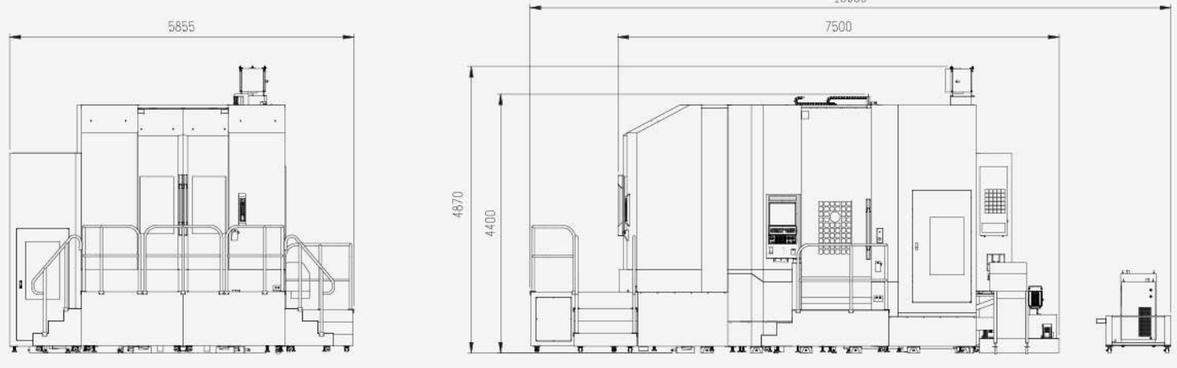
◆ UB-660



◆ U-800



◆ U-1000



MACHIINE ACCESSORIES

NO	Features	U-250		U-600P		UB-660		U-800		U-1000	
		STD	OPT	STD	OPT	STD	OPT	STD	OPT	STD	OPT
1	3-axis pro-tensioned ballscrew	●	-	●	-	-	-	●	-	●	-
2	Automatic lubrication system	●	-	●	-	●	-	●	-	●	-
3	#30_10000rpm Direct-drive spindle	●	-	-	-	-	-	-	-	-	-
4	#30_12000rpm/15000rpm Direct-drive spindle	-	●	-	-	-	-	-	-	-	-
5	#40_10000rpm Direct-drive spindle	-	-	●	-	-	-	-	●	-	-
6	#40_12000rpm Direct-drive spindle	-	-	-	-	-	-	●	-	-	-
7	#40_15000rpm/18000rpm Direct-drive spindle	-	-	-	●	-	-	-	●	-	-
8	#40_12000rpm Built-in spindle	-	-	-	-	●	-	-	-	-	-
9	#40_18000rpm Built-in spindle	-	-	-	-	-	●	-	-	-	-
10	#40_24000rpm Built-in spindle	-	-	-	●	-	-	-	●	-	-
11	#50_8000rpm Built-in spindle	-	-	-	-	-	-	-	-	●	-
12	CTS & Filtering System	-	●	-	●	-	●	-	●	-	●
13	Spindle oil cooler	-	●	●	-	●	-	●	-	●	-
14	Spindle air blast	●	-	●	-	●	-	●	-	●	-
15	Spindle air sealing	●	-	●	-	●	-	●	-	●	-
16	3 Axes Coolant through	-	-	-	●	-	-	-	●	-	●
17	#40-24T Nos.ATC	-	-	●	-	-	-	-	-	-	-
18	#40-30T/40T/60T Nos.ATC	-	-	-	●	-	-	-	-	-	-
19	#40-40T Nos.ATC	-	-	-	-	●	-	-	-	-	-
20	#40-50T Nos.ATC	-	-	-	-	-	●	-	-	-	-
21	#50-40T Nos.ATC	-	-	-	-	-	-	-	-	●	-
22	#50-60T Nos.ATC	-	-	-	-	-	-	-	-	-	●
23	#30-26 Horizontal type magazine	●	-	-	-	-	-	-	-	-	-
24	#40-32T (32 * 1) Horizontal type magazine	-	-	-	-	-	-	●	-	-	-
25	#40-48T/60T/64T/96T/120T Horizontal type magazine	-	-	-	-	-	-	-	●	-	-
26	Turning function	-	-	-	-	-	●	-	●	-	●
27	Linear scale on X/Y/Z-axis	-	●	-	●	●	-	●	-	●	-
28	Angle Encoders on 4/5-axis	-	●	-	●	●	-	●	-	●	-
29	Heat exchanger	●	-	●	-	-	●	-	●	-	-
30	Air condition(Note:European control must be optional)	-	●	-	●	●	-	●	-	●	-
31	Dust-tight electrical cabinet	●	-	●	-	●	-	●	-	●	-
32	Hydraulic unit	●	-	●	-	●	-	●	-	●	-
33	Air Blow (M Code)	-	●	●	-	-	-	●	-	-	-
34	Air Blast	-	●	●	-	-	-	●	-	-	-
35	Flush	●	-	●	-	-	-	●	-	-	-
36	Ethernet interface	●	-	●	-	●	-	●	-	●	-
37	Levelling bolts & plates	●	-	●	-	●	-	●	-	●	-
38	Back Side Chip conveyor	-	●	-	●	-	-	-	-	-	-
39	Left Side Chip conveyor	-	-	-	-	-	●	-	●	-	-
40	Right Side Chip conveyor	-	-	-	-	-	-	-	●	-	●
41	Chip Cart	-	●	-	●	-	●	-	●	-	●
42	Flushing	-	●	-	●	●	-	-	-	-	-
43	Front shower tube	-	-	-	-	-	-	-	●	●	-
44	Top roof	●	-	-	●	-	-	-	-	●	-
45	CE	-	●	-	●	-	●	-	●	-	●
46	Coolant gun	-	●	-	●	-	●	-	●	●	-
47	LED Working light	●	-	●	-	●	-	●	-	●	-
48	3-color signal light	●	-	●	-	●	-	●	-	●	-
49	Wireless Workpiece Measurement	-	●	-	●	-	●	-	●	-	●
50	Laser Tool Length Measurement	-	●	-	●	-	●	-	●	-	●
51	Automatic door	-	●	-	●	-	●	-	●	-	-
52	Automatic top roof	-	-	-	●	-	-	●	-	-	-
53	Water-oil separator system	-	●	-	●	-	●	-	●	-	●
54	Water-oil separator	-	-	●	-	●	-	●	-	●	-
55	Operation & Maintenance manual	●	-	●	-	●	-	●	-	●	-

* Specifications are subject to change without prior notice.

MACHINE SPECIFICATIONS

MODEL		Unit	U-250	U-600P	UB-660	U-800	U-800T	U-1000
Travel								
X axis travel		mm	350	460	1250	800		1250+320
Y axis travel		mm	300	620	750	935+315		1250
Z axis travel		mm	250	400	820(V)/950(H)	640		1000
C axis rotation angle		degree	0°~360°	0°~360°	0°~360°	0°~360°		0°~360°
A(B) axis rotation angle		degree	+120° ~ -120°	+110° ~ -90°	± 110°	+120° ~ -120°		+30° ~ -180°
Spindle nose to table surface	Vertical Spindles =0	mm	135-385	150-550	90-910	85-725	80~720	120-1120
	Horizontal Spindles =180		-	-	280-1230	-		20-1020
Table surface to floor		mm	860 ± 5	750 ± 5	930 ± 5	900 ± 5		1492 ± 5
Table								
Table dimension		mm	Ø250	Ø600	Ø660(1450x700)	Ø800		1000x1000
Table hole dimensions		mm	Ø20 H7	Ø60 H7	Ø50 H7	Ø60 H7		Ø55 H7
T slots		mm	6x12	5x14	5x18	7x14		M20x2.5
Max. table load		kg	100	350	1500(C axis:1000)	1200	1000	2300(APC)
Working Torque	A(B) axis(Tilting Axis)	N-m	1800	2520	993	3340	3480	8640
	C axis(Rotary Axis)		600	672	869	1230	1500	963
Max. rotation speed	A(B) axis(Tilting Axis)	rpm	33.3	25	50	50	45	30
	C axis(Rotary Axis)	rpm	50	25	85	100	800	11
Max. diameter of workpiece		mm	Ø350×250(H)	Ø600×400(H)	Ø660×800(H)	Ø800×640(H)		Ø1000×1000(H)
SPINDLE								
Spindle speed		rpm	Direct-drive type 10000	Direct-drive type 10000	Builit-in type 12000	Direct-drive type 12000		Built-in type 8000
Spindle taper		-	7/24 Taper NO.30	7/24 Taper NO.40	7/24 Taper NO.40	7/24 Taper NO.40	HSK63T	7/24 Taper NO.50
Spindle power		Kw	3.7 / 5.5	7.5 / 11	29.5/37	20 / 37		19 / 28
FEED RATE								
X-axis rapid traverse		m/min	36	30	50	48		50
Y-axis rapid traverse		m/min	36	30	50	48		50
Z-axis rapid traverse		m/min	36	30	50	48		50
ATC								
Tool changing time (Tool-to-Tool)		sec	4 / 60Hz	7 / 60Hz	-	10 / 50Hz		3.2 / 60Hz
Tool changer		-	Drum type	Arm type	Arm type	Drum type		Arm type
No. of Tools		-	26	24 (30、40、60)	40(50)	32(48、60、64、96、120)		40 (60 / 90 / 120)
Pull stud		-	P-30T（45°）	P-40T (45°)	P-40T (45°)	P-40T (45°)		P-50T (45°)
Max. Tool weight		Kg	3	7	7	7		25
Max. Tool length		mm	150	280	350	300		550
Max. Tool diameter		mm	ϕ60	ϕ80	ϕ76	ϕ75		ϕ125
Max. Tool diameter (No adjacent tool)		mm	ϕ65	ϕ150	ϕ150	ϕ125		ϕ250
OTHERS								
FLOOR SPACE		mm	1750(W)X3500(D)	3630(W)X3510(D)	3850(W)×3950(D)	3220(W)X4300(D)		10900(W)X5855(D)
MACHINE WEIGHT		Kg	4600	8850	12530	18500		38000
MAX. MACHINE HEIGHT		mm	2805	3000	3865	3600		4870
POWER CAPACITY		KVA	25	35	90	90		150
AIR SOURCE		bar	6~8	6~8	6~8	6~8		6~8

* Specifications are subject to change without prior notice.